THE PROJECTED PICTURE TRUST

Information Sheet Number Two

The Power's Projector

Researched by John Cannon

Our second information sheet follows on the Simplex by featuring another American machine that in its day captured a significant place in the British market.

The reasons for presenting the work of Nicholas Power and his successor, the Nicholas Power Company Inc., are three-fold: firstly to develop the story of the Simplex/Powers feud of 1913-1916, secondly to introduce the unique intermittent motion of the pin-cross and thirdly since the PPT has, in its most significant purchase to date, acquired two fine, almost complete examples of the Power's projector.

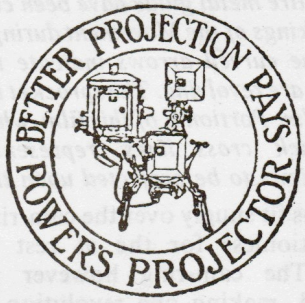
The format of the sheet will remain the same with a basic chronology and a study of the essential Power's projector. As the pin-cross movement is such a fascinating marvel of cinematograph engineering drawings are introduced which we trust will become a regular feature of these sheets.

Nicholas Power had the ability of a great engineer and inventor coupled with a very acute and far-sighted business sense. From the beginning, Nicholas Power built up a strong patent wall around his developments: between 1904 and 1922 he obtained 57 patents covering the design and construction of all his important innovations and improvements. He had a great flair for business and quickly replaced model after model — strikingly so when compared with the classic line of the Regular Simplex. His greatest achievement, the pin-cross movement, stands as a marvel of engineering ingenuity to this day with its highly desirable 5:1 pull-down ratio. It took the old rival Simplex until late 1957 to introduce such a ratio with its high-speed Maltese Cross movement available as an option for its X-L model.

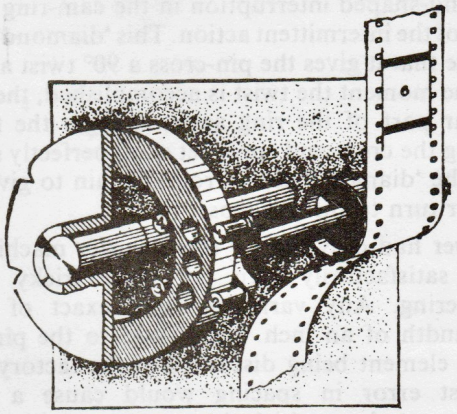
The production range of the Power's projectors was the No. 4 (c1904), the No.5 (1906/7) — both standard Geneva/Maltese Cross projectors — the No.6 (1909), the No.6A (1911), the No.6B (1920) and the No.6B Improved of 1925 which like the 6A was a refined version of the previous model — in this case the new front plate and lens mount now had rack and pinion adjustment with double knobs so that focussing could be done from either side of the machine; a framing lamp was mounted inside the mechanism and a two-sided Ruby Glass eye-shield introduced.

The Power's Pin-Cross Intermittent Mechanism
Patented Feb. 24th, 1914.

Two parts are used, similar in relation to the pin-wheel and star of the Maltese Cross only reversing the roles since it is the part with the pin that is the intermittent. The driving element in the Power's motion is a revolving cam, virtually diamond-shaped, upon the face of a heavy steel disc which carries a cam-ring as on the pin-wheel of the Maltese Cross. The driven element is a cross on the end of the intermittent shaft. Cut from a single block of steel in manufacture, a pin is integral with each arm of the cross. The parts of the intermittent are enclosed in an oil-tight casing with oil-feed cap and when properly filled with oil the intermittent drive is practically noiseless.



NICHOLAS POWER COMPANY, Incorporated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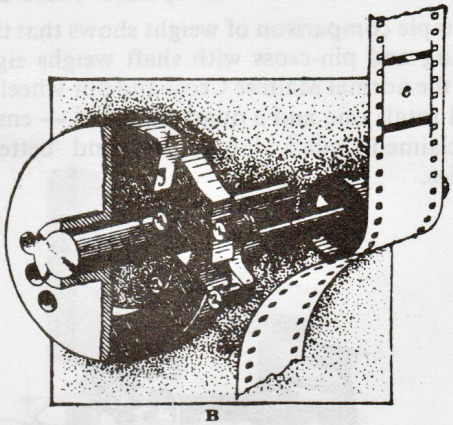
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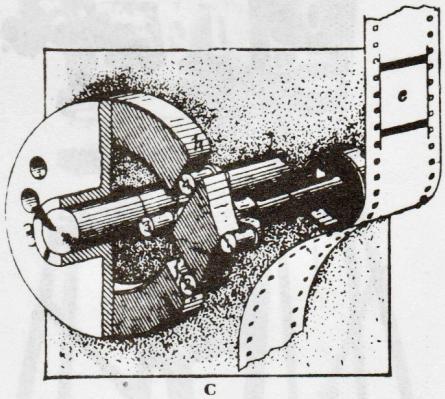
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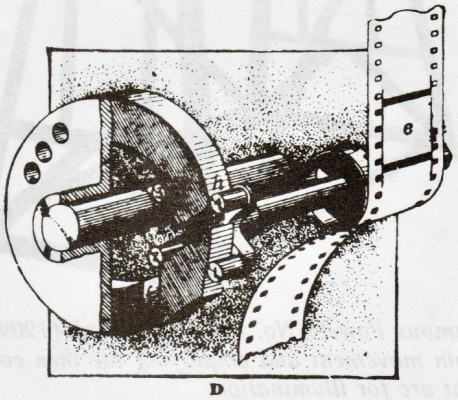
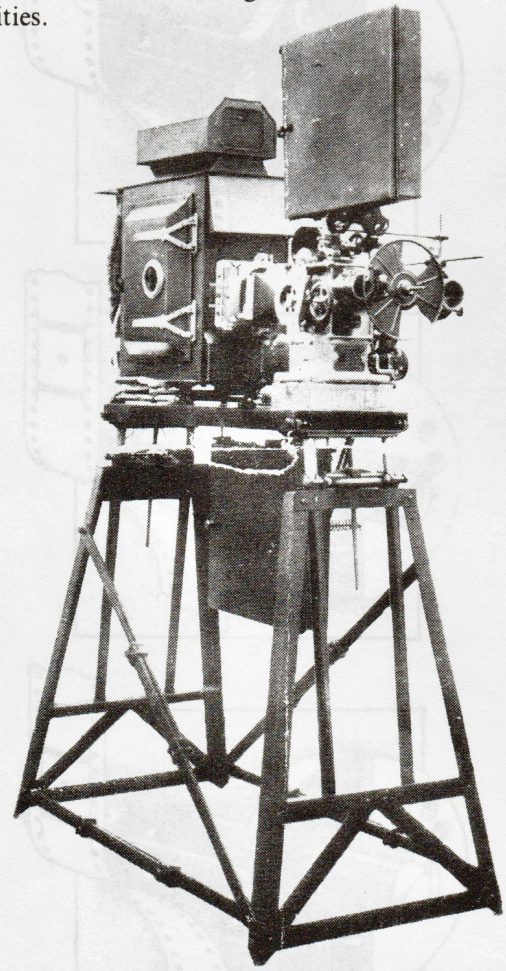

D

Drawings A, B, C and D show Power's Intermittent Movement in action. A portion of the back of the cam-ring disc, and the entire metal guide have been cut away so as to expose the workings of the Movement during one revolution of the disc. The curved arrows indicate the direction in which the parts are revolving. The sprocket is in mesh with a short strip of film. Portion E of this film, which lies between the heavy black cross lines, represents one of the photographic views to be projected upon the screen.

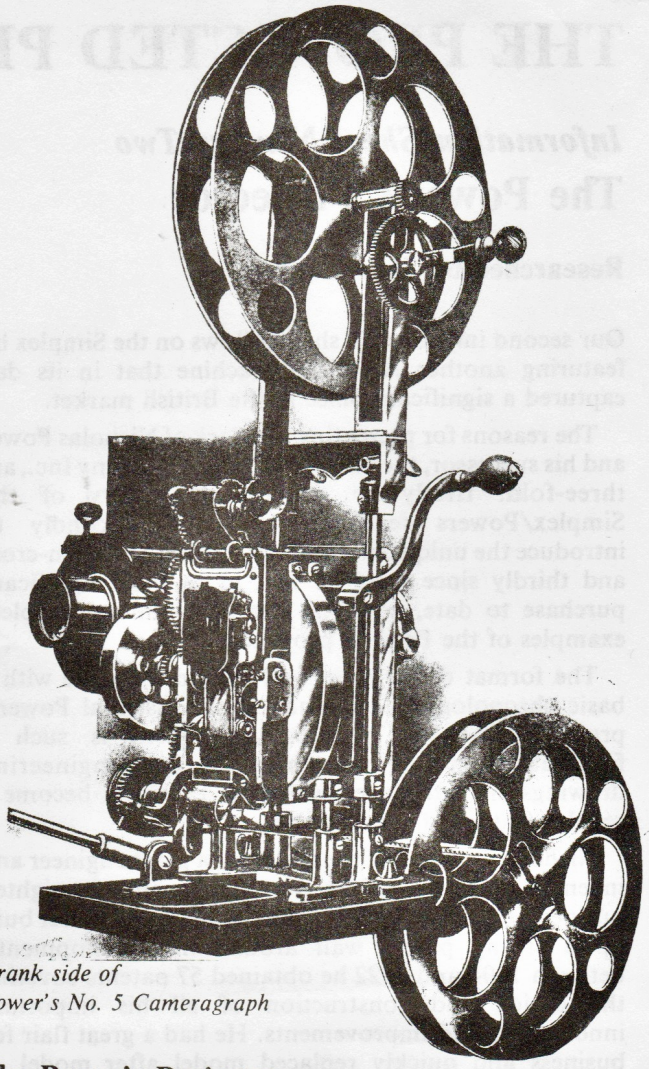
The four pins fit snugly over the cam-ring which holds the cross motionless for the at rest period of the intermittent. The cam-ring however revolves at a constant speed, making one revolution for each pull-down of the pin-cross and attached sprocket shaft. The diamond-shaped interruption in the cam-ring holds the secret of the intermittent action. This 'diamond' is of such a shape that it gives the pin-cross a 90° twist as it passes by. The moment the twist is accomplished, the perfectly circular part of the ring again engages the four pins, holding the cross and sprocket shaft perfectly stationary until the 'diamond' comes round again to give another quarter turn to the pin-cross.

Power had only two or three master machinists who could satisfactorily turn out these tricky pieces of engineering. Any variation from exact of one ten-thousandth of an inch would lead to the pin-cross or driven element being discarded at the factory since the smallest error in spacing would cause a six cycle disturbance about which the operator could do nothing.

A simple comparison of weight shows that the Power's cam-ring and pin-cross with shaft weighs eight ounces whilst the normal Maltese Cross and pin-wheel unit of the period totals one and a quarter ounces — ensuring as it was claimed, much longer life and better wearing qualities.



The famous Powers No. 6 Cameragraph (1909) having a solid-pin movement and employing the then conventional straight arc for illumination.



Crank side of Power's No. 5 Cameragraph

The Power's Projector

To modern eyes easily recognisable by the square spool-boxes to make spool-changing easier — not to mention manufacture, the Power's is an open mechanism finished in bright nickel. All external parts of the main frame of the mechanism have this finish and are marked with N.P.Co. or N.Power Co. or even on the sprockets post-1925 à la Simplex with Powers in script form and I.P. Corporation. The mechanism serial number (very often with examples found today different from the brass maker's plate) is to be found at the top of the main frame behind the lens mount plate. The intermittent, upper and lower feed sprockets are all four-picture in the American tradition. The antiquated and unsatisfactory (by today's standards) gate of only three frames of film in length which needed powerful pad tension especially on new prints made the Power's prone to fits of violent picture jump as pad tension could only be increased so far. The front shutter was available with two or three blades, the latter for increased freedom from flicker at very high light levels. The quietness of the Power's in operation never fails to astonish operators meeting it for the first time, even bearing in mind that open mechanisms are usually quieter than enclosed mechanisms where the housing can act as a resonator.

Indubitably primitive by today's standard with the dust-catching open head, the toggle-drive gearing of the intermittent (on the No.5), the short film gate, the hinged gate door and the inability at first to accept short focus lenses, the Power's nevertheless worked well and was easy to service and repair, fully justifying the makers' slogan that "Better Projection Pays".

Wear did occur inevitably in the projector and especially in the solid pins of the pin-cross in the No.6;

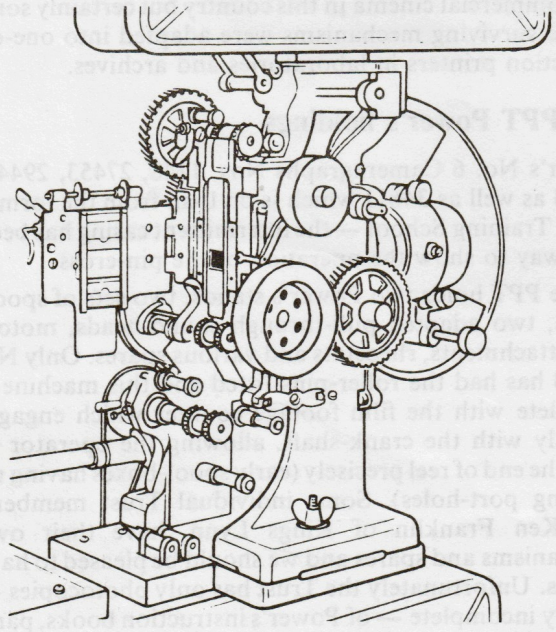
'flats' worn on the pins caused back-lash between the pin-cross and the cam-ring making the picture jiggle six times a second at 24f.p.s. Power largely overcame this problem by the introduction of roller pins for the No.6B. The motion was now extremely steady and much easier to adjust and service than the conventional Maltese Cross. The rapid movement of the intermittent motion permitted narrower shutter blades to be used for less light loss. With a three bladed shutter being operated at 24 f.p.s. there is a 72 cycle per second cut-off but the same light transmission (50 per cent) as a standard Maltese Cross movement with a two blade shutter. Were a two blade shutter to be used the light transmission from the Power's would be as high as 66⅔%.

The Automatic loop-setter, another unique Power's invention, deserves some mention even though it was in practice often removed in later years. It was designed to eliminate the loss of the lower loop caused by bad joins, torn film, excessive take-up tension or other imperfection. Its construction is simple; it is directly connected with the take-up by means of an automatic clutch arrangement. Passing the film under an extra roller primes the mechanism. When the lower loop is lessened or lost the roller is elevated so as to disengage the clutch on the lower feed sprocket from the take-up, allowing the lower feed sprocket to rest during one revolution of the intermittent sprocket. The lower loop is thus re-formed and automatically the lower feed sprocket is re-engaged with the take-up. The lower loop could in this way be re-set as often as 15 or 20 times within a minute where the ordinary defects in the film would in any one instance have ripped it.

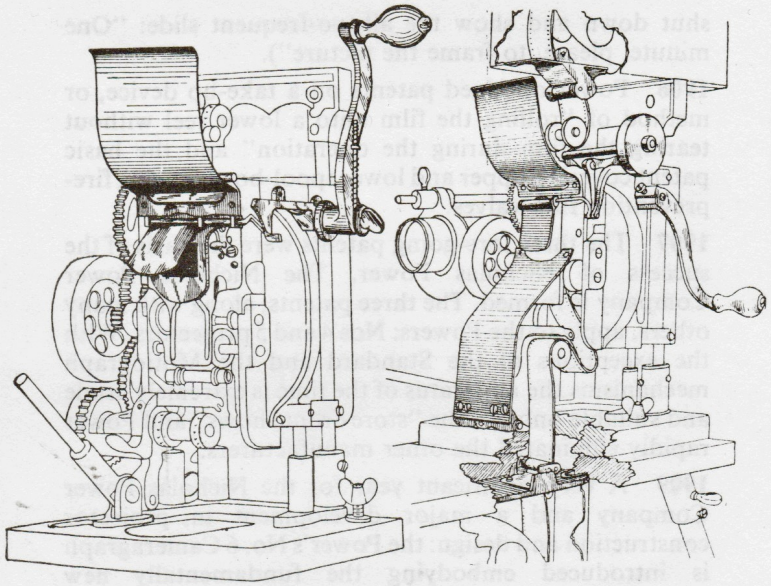
The Power's safety devices were similarly important inventions: the automatic fire-shutter operated by a centrifugal clutch and the fire-proof spool-boxes with the patented take-up device available for either twelve or fourteen inch reels.

The cost in dollars to the American buyer of the Power's would be as high as 66⅔%.

Mechanism (without lens)	132.50
Lamp-house	26.00
'Perfect' arc	15.00
Stand	14.50
Top spool-box	10.00
Bottom spool-box with take-up	17.50



No. 6 Operating side



Cameragraph Safety Shutters Style A and B

Useful reference material

Richardson's Blue Book. 4th Edition. 1923. pages 627-662
Gives line drawings and diagrams of 6B, parts lists for 6A and 6B as well as instructions on operation and replacement of parts.

Falk's Motion Picture Projection. 1922. Pages 233-235
Photographs and line-drawings of the pin-cross movement and within the section on the Power's projector on page 244 is a photograph and line-drawing of the automatic loop-setting mechanism.

Encyclopaedia of Motion Picture Work. Vol. 1. 1918. Pages 189-206
Details, drawings and diagrams of the Power's No. 5 and 6 mechanisms and accessories as well as a parts list for the No. 5.

CHRONOLOGY OF THE POWER'S PROJECTOR

1898 Nicholas Power of the Novelty Theatre in Brooklyn is trained by Edwin S. Porter to operate the Beadnell projector.

1902 Nicholas Power built his first projector, the Peerlescope, in a little shop on Nassau Street, New York City.

This projector was equipped with a gaslight source and was belt-driven directly from the rim of the crank-wheel. The film, upon passing through the projector, dropped into a cloth bag, which, however, was soon replaced by a sheet metal box. As much as 3000 feet of film was run into this box in a loose heap, with the ends of each reel left hanging out of the opening to be retrieved later for rewinding.

1902-1907 Contemporary machines were the Edison Kinetoscope, the Lubin, the Dressler, the Vitascope (built by Thomas Armat and reputedly the first loop-forming mechanism), and the Motioscope, produced by Roebuck and later known as the Motiograph. Several other "-graphs" and "-scopes" were marketed during this time, among which was the Standard projector.

1904 Nicholas Power was the first to invent a satisfactory device for centring the picture in the aperture while the projector was running (eliminating the need to

shut down and show the all-too-frequent slide: "One minute, please, to frame the picture").

1906 Power obtained patents on a take-up device, or method of "rolling the film onto a lower reel without tearing the film during the operation" and the basic patent covering upper and lower spool-boxes having fire-prevention film valves.

1907 The three fore-going patents were the basis of the success of Nicholas Power. The Nicholas Power Company is formed. The three patents, along with many others, apply to the Powers: Nos 4 and 5 projectors. With the exceptions of the Standard and the Moticgraph mechanisms the apparatus of the time is extremely crude and suitable only for the "store-front shows" and Power rapidly eliminated the other manufacturers.

1909 A very significant year for the Nicholas Power Company and a major development in projector construction and design: the Power's No. 6 Cameragraph is introduced embodying the fundamentally new intermittent movement. However two new organisations entered the business — the Precision Machine Company with the Edengraph (fore-runner of the Simplex) and the American Motion Picture Machine Company which developed the Standard projector.

1911 Whilst the Simplex is being developed there are only two active projector manufacturers: the Nicholas Power Company who this year introduced the Power's No. 6A outfit which is an all-metal equipment including stand, lamp-house, spool-boxes and a No. 6 mechanism — doing away with the rather flimsy earlier wooden table-board — and also the Enterprise Optical Company (Motiograph). The American Motion Picture Machine Company, makers of the Standard projector, had suffered badly in competition with the new Power's intermittent and its greater illumination and the company failed in 1913.

Adverts appear in Kine Weekly inviting exhibitors to "Place your order now and avoid disappointment!" The introduction of the Power's projector into Britain by the Walturdaw Company puts it in competition with amongst other machines: the Butcher's Empire No. 10 (maltese-cross) at £30, the Kamm (maltese-cross) at £35, the Brewstergraph No. 3 at £26.10s, the Tyler-Ernemann Imperator and the compatriot Motiograph, distributed by Brockliss, of which already eleven are installed in London and seventeen in Glasgow.

1913-1916 The famous Powers-Simplex feud. The Precision Machine Company rapidly began a strenuous and persistent battle with the Nicholas Power Company to achieve a place in the market. That they did so was largely due to the popularity of the Simplex with the projectionists themselves for whom the more compact and completely enclosed mechanism had great appeal.

1920 The Powers No. 6B appeared in America with roller-pins fitted, making it the most successful and indeed final Powers projector ever produced.

By 1920 over 5,000 Powers No. 6 mechanisms had been sold in the United Kingdom.

1924/25 The Powers No. 6B arrived in Britain at a cost of £150. The spool-boxes were very large holding over 2000 feet; the cover shutter had vernier adjustment and the take-up sprocket was fitted with a clutch to lengthen the lower loop whilst the machine was in motion.

1925 The International Projector Corporation is formed, merging the Nicholas Power Company with the Acme Motion Picture Projector Corporation and the Precision Machine Company. With both Simplex and Powers being made under one roof, a new era of development in projector manufacture began. The Super Simplex (1928) was one of the first fruits. The patents covering a complete new projector embodying numerous basic ideas and improvements which had been issued to the Nicholas Power Company were not pursued. This new projector was to be known as the Powers No. 7 but it was never put into production.

1927 The earlier Powers No. 6 mechanism is being sold at £8.5s in the United Kingdom being solely distributed by Power's Distributing Corporation, Polebrook House, Golden Square.

1928 The Powers and the Simplex are both distributed by J. Frank Brockliss, 10 Poland Street. The Powers 6B is installed in the Carlton, Haymarket and the Paramount, Paris.

1922/9 Now occurred one of those entirely unforeseen and wholly unpredictable situations which virtually eliminated the Powers projector. Sound reproducing equipment made by Western Electric and later by RCA were in the beginning made for adaption to the Simplex projector only because several of the large circuit early buyers of sound equipment were mostly equipped with Simplex mechanisms. The first wave of orders for the new sound equipment was so heavy that neither W.E. nor RCA paid any attention to the development of a unit for the Powers projector. This was the death-blow to the Powers.

Despite this untimely blow the Powers projectors were kept working and being introduced into cinemas not 'wired for sound' and eventually since there was obviously a great deal of life left in the later mechanisms, sound systems were introduced for the Powers mechanism which with its awkward configuration of the film passing centrally through the mechanism was not perfectly straight-forward.

1930 onwards The Powers continued to be sold whilst stocks lasted with Brockliss and ample parts were available until the Second World War. The Peerless Magnarc, introduced to this country in 1935, had a special adaption carriage for the Powers projector showing that the machine was not totally forgotten. Many Powers projectors continued to work well into the 1940's and indeed some lasted into the 1950's — an example being the Bijou Cinema, Reddish where Powers were in use for the life-time of the cinema itself. No Powers machine was ever adapted for Cinemascope in the commercial cinema in this country but certainly some of the surviving mechanisms were adapted into one-off reduction printers in laboratories and archives.

The PPT Power's holdings

Power's No. 6 Cameragraphs Nos. 1148, 27453, 29446, 36973 as well as 34611 which is on loan from the former Rank Training School — the intermittent casing has been cut away to show the operation of the pin-cross.

The PPT holds two Power's stands, two sets of spool-boxes, two adapted pull-through sound-heads, motors and attachments, rheostats and various spares. Only No. 2/453 has had the roller-pins fitted and this machine is complete with the film footage counter which engages directly with the crank-shaft, allowing the operator to time the end of reel precisely (early spool-boxes having no viewing port-holes). Some individual Trust members, like Ken Franklin of Kings Lynn, have their own mechanisms and spares and we should be pleased to have details. Unfortunately the Trust has only photocopies — mainly incomplete — of Power's instruction books, parts lists and sales literature. Can you help with these or photographs of Power's actually installed in any British cinemas or details of known installations? ■